DOCUMENT RESUME

ED 230 431 SE 041 929

AUTHOR de la Mothe, John R.
TITLE Unity and Diversity in STS Curricula.
PUB DATE Apr 83
NOTE 6p.; Document may not reproduce well due to small print.
PUB TYPE Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS College Curriculum; *College Science; Educational Objectives; Environmental Education; Higher Education; *Interdisciplinary Approach; *Program Descriptions; *Research Methodology; *Science Curriculum; Science Education; Social Influences; *Technology
IDENTIFIERS *Science and Society

ABSTRACT

The study of science, technology, and society (STS) has, over the past decade, become established in Great Britain, Canada, and the United States as the fastest growing area of teaching and research in institutes of higher education. While it is reasonable to describe STS as an important socio-educational movement, it is thematically erroneous to think of it as a "discipline" of study. Therefore, the unity and diversity of STS is considered by discussing the nature of the field as well as by pointing out trends and problems within STS, and its importance to education and society. Included in the discussion of trends and problems are summaries of five STS interdependent research themes (humanistic, relativistic, reflexive, de-simplifying, and normative tendencies) and a list of three major impediments affecting the field. (JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED230431

UNITY AND DIVERSITY IN STS CURRICULA

John R de la Mothe*
Concordia University

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
✓ This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

INTRODUCTION

There are more things in Heaven
and Earth Horatio,
Than are dreamt of in your philosophy.

Organization theory defines a social system as an information processing, decision-making network which steers the organization towards its general goals. [Mouzelis, 1967] As 'information societies' become increasingly 'post - industrial' the decision function has beome critically enhanced. [Bell; Martin] Policy-making can be seen as that form of communicated information which provides the ultimate basis for decision.

In modern societies the number of transactions has exploded thus forcing the development of new forms of bureaucratic control mechanisms. The character of these emerging mechanisms is entirely dictated by a dominant social paradigm which is itself genetically deformed. The pre-eminence of this paradigm has been largely unchallenged - even in the face of major anomalies or cybernetic dysfunctions - because of a long record of micro-system 'success'. [Bronowski & Mazlish] However as the use and legitimation of this core paradigm is extended into more strategic and delicate sectors which require augmented control the incidence of failure has increased, carrying with it threats ranging from economic collapse to Armageddon. The core of this paradigm emerges from an 'omniscient rationality' [Manfred], linear and reductionist in mode and infused by a technological paradigm of infallibility. Growth is the goal. Power and profit are the measures of success. Herein is defined the overwhelming character of the West.

Technology, culture, economics and politics - the four highly integrated components of our society - are equally locked into this growth imperative. Individual refusal to participate is impossible due to the inescapeable proximity of the social structure. In not acknowledging the limits to growth this paradigm has sponsored the subdivision of needs and markets in an attempt to secure the illusion of expansion. This is true not only of economic systems but perhaps is more insidious in epistemological systems. [Snow]

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
John R. de la Mothe
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

*The author wishes to thank the generous assistance of McGill University without whom this paper could not have been prepared or presented.

SE041929

The subdivision of knowledge into smaller dissociated fragments is arbitrary and dangerous [de Chardin, 1979; Boulding, 1982] for it removes knowledge (and consequently enlightened action based on knowledge) farther from the reality of inter-relationship upon which the social structure is based, and through which the social structure gains definition and identity. Reductionism fosters the belief within all sectors that each man is an island, totally self-sufficient and independent from other systems. In an overwhelmingly technocratic society this implicit belief invites chaos and forbids the possibility of effective, survival-laden decisions and system analyses. Just as the by-product of nuclear fission is hazardous waste and fussion offers life-giving liquid, epistemological/social fissions reduce our capacity to effectively process information and steer towards (or criticaly identify) our general goals. What is needed are more fussive models. STS may be one such model.

THE NATURE OF THE FIELD

It can not be said that curiousity, the search for truth or any other altruistic motive is the source from which the study of Science, Technology and Society (STS) grew. The study of STS was born of war [Solomon, 1977], and World War II was (for obvious reasons) a crucial turning point in the changed relationship of science to military, economic and political power. Throughout the post-war, post-Sputnik and dystopianism eras [Gendron, 1977] STS has continued to grow and has taken its place as an important, timely and syncretic field of study.

STS programs have become and remain the fastest growing field of study in colleges and universities [Roy and Hawk, 1976]. This is true in Canada and the United Kingdom but is especially true of the U.S. [de la Mothe, 1982]. These programs have ranged in ambition and commitment from a few isolated courses to full-fledged departments offering both undergraduate and graduate degrees. They have been given many different names, and have been offered through or in conjunction with several disciplines and professional fields, ranging from humanities to engineering.The current approximate breakdown of course offerings at post-secondary institutions is as follows:

	USA		CAN		UK	
	No.	%	No.	%	No.	%
a.	691	(60.5)	216	(64.5)	131	(73.5)
b.	106	(9.0)	32	(9.5)	6	(6.5)
c.	94	(8.0)	12	(4.0)	2	(1.0)
d.	75	(6.5)	45	(13.0)	12	(7.0)
e.	56	(5.0)	11	(3.5)	---	---
f.	40	(3.5)	7	(2.0)	12	(7.0)
g.	39	(3.5)	4	(1.0)	7	(3.5)
h.	38	(3.5)	8	(2.5)	7	(4.0)
i.	5	(0.5)	---	---	1	(0.05)
	1144	(100.)	335	(100.)	178	(100.)

a. History, Philosophy and Social Science
b. Policy Studies
c. Humanities
d. Environmental and Energy Studies
e. Professions (eg. Social Aspects of Engineering)
f. International Affairs and Development
g. Cybernetics, Systems Theory and Computers
h. Future Studies
i. Peace Studies

(Indeed, while it is the case that many more courses exist in such areas as system theory or international development, this innumeration only includes those courses which are expressly concerned with the role of science and technology.)127 programs are offered at 92 U.S. colleges and universities while courses are available at 215 locations. In the U.K. 37 programs exist at 27 polytechnics and universities while 46 offer courses. There are 14 programs offered at 10 Canadian universities with 34 CEGEPs, colleges and universities offering courses. This diversity of activity reflects the multidisciplinary character of the endeavor, and suggests a widespread recognition of its importance. On the other hand, the same diversity is a problem, as it leads to considerable uncertainty among practitioners, students, administrators and employers regarding the appropriate nature of the educational experiences and the expected competencies of the program's graduates.

Strong STS-related publications have also emerged in the past decade featuring 91 journals and newsletters (aside from traditional discipline publications) of which 62 originate in the US, 20 in the UK and 9 in Canada. Despite the relatively brief history of STS-related publishing, many journals are of extremely high quality, such as Bulletin of Science, Technology and Society (Pergamon), Science, Technology and Human Values (Harvard/MIT) and the STS Curriculum Newsletter (Lehigh University).

Todate, approximately 3000-3200 individuals are actively involved in STS post-secondary teaching and research in the three countries. This figure does not include personnel associated with research organizations or government agencies such as the National Science Foundation, Exxon, the Science Council of Canada, and the Social Science Research Council (SSHRC) which has recently identified STS (known in Canada as the Human Context of Science and Technology, or HCST) as a stategic area for funding

[Hooker, 1980] and has allocated one million dollars for research in this area.

TRENDS AND PROBLEMS

One of the major problems in dealing with the social impact of science and technology is the sheer breadth of the area. Spiegel-Rosing [1977] recognizes this and subdivides the field into five interdependent research themes:(1) humanistic, (2) relativistic, (3) reflexive, (4) de-simplifying, and (5) normative. These can be summarized as follows.

Humanistic Tendencies: In the study of science, technology and society these tendencies see " the actor not as an abstract unit of analysis or as a positivistic robot but as a human being complete with emotions, conflicts, inconsistencies and who does not live in a vacuum but rather mediates between the wider sociopolitical and cultural context and the kind of science that results from it." [Spiegel-Rosing, 1977.pp.20] Within this framework there are essentially three focii of research. First is the image of the scientist as subjective being and the social process. Second is the shift of investigation away from preconceived concepts towards research that starts from the concepts as perceived by the actor in his specific situation- "thus making new methodologies relevant to the study of STS"[Spiegel-Rosing, 1977]. And third is the movement away from a technocratic perspective in research policy issues and technology management.Thus decisions involving technology and science are seen as value and conflict laden.

Relativistic Tendencies: The major undercurrent of the relativistic movement sees (as an offspring of humanism) historic events not as valid for all time, but as relative within a given temporal framework consistent with the origins of the phenomenon itself. This is also referred to as the 'historization' of research. In the philosophy of science, for example, there is a growing awareness of the epochial changes in the very parameters of scientific concepts.

Reflexive Tendencies: If the importance of the actor is accepted as is presented in the humanistic tendency of STS then it can hardly be avoided to apply this perspective to the scientific research as the object of investigation. The STS researcher is obviously affected by cultural and socio-economic contexts in the questions that he raises, the methods he uses and the conclusions he arrives at. It is of obvious importance to inquire how these are reflected in his research.

De-Simplifying Tendencies: There is a clearly discernable tendency in STS research to desimplify its approach methodologically as well as conceptually. This can be distinguished in a movement away from 'black boxism', and a discontentment with linear, one factor polarized models of explanation.

Normative Tendencies: This refers to an increasing readiness to take the normative aspects of science and technology into account. These normative aspects involve the criticisms of science and the changing public conception of Science and Technology, the social responsibility of scientists and technologists, the ethics of science and so forth.

While the field is currently in some distress, due to general austerity, there is a rapidly growing sense of maturity and direction in the field. This is not to say that a discipline is emerging; it is not. But, there is a growing sense that a unique body of professional practice is emerging; a body of practice that draws heavily from engineering, management, economics, law, history and public administration.The field also suffers from three major impediments:

1- lack of comparative research
2- a tendency to study the more visible or more 'heroic' events in the social impact of science such as the Manhatten Project or the life of Newton, instead of the foundation of the science/society interface
3- there appears to be a continuing fragmentation among researchers with regards to acceptable or appropriate methodological approaches.

CONCLUSION

STS is an increasingly important area of study and although it suffers from definate deficiences and tendencies,it does make a concerted effort to transcend traditional disciplinary divisions and address crucial questions. In so doing, it encourages a somewhat more critical approach to the accepted reductionist rationality. As a formal model upon which to base future educational systems, re-established more meaningful epistemological divisions or with which to resolve or control megatrends, STS is only suggestive of the possibilities which can be made available. As an interim framework however,STS has much to offer. We can no longer permit trend to become destiny. We can not afford to base our futures upon outrated paradigms and ideologies. It is time to begin imagining a Fourth World composed of the equity vision, the democratic vision and the ecological vision [Knelman, in Lasker, 1981]. STS offers hopeful signs and insights into combining these three valid views in which the rights of Nature, the individual and society integrate and grow inseparable. As a full-blown

model STS is inappropriate, but as a creative seed it is bursting with promise.

REFERENCES

Ashby, R.
1956 "An Introduction to Cybernetics." New York: John Wiley.

Barnes, Barry
1977 "Interests and the Growth of Knowledge." London: Routledge

Beer, Stafford
1974 "Designing Freedom." Toronto: CBC
1979 "Heart of the Enterprise." New York: John Wiley
1981 "Brain of the Firm." New York: John Wilry

Bell, Daniel
1977 "The Coming of Post-Industrial Society." New York

Berger, P. and Thomas Luckmann
1966 "The Social Construction of Reality." Harmondsworth: Penguin

Bertalanffy, L. von,
1967 "General Theory and Systems." Social Science. VI 6.

Boulding, K.
1981 "Presidential Address." AAAS

Bronowski, J. and B. Mazlish
1968 "The Western Intellectual Tradition." New York: Harper

Cairncross, Sir A.
1980 "Science Studies." London: Nuffield Foundation

Connerton, Paul
1980 "The Tragedy of Enlightment." Cambridge: CUP

de Chardin, P.
1979 "The Future of Man." Paris

Dechert, C.R. (ed.)
1966 "The Social Impact of Cybernetics." New York: Simon and Shuster

de la Mothe, John R. (ed.)
1982 "Science, Technology and Society: A Network Directory of Teaching and Research Activities in Canada, the UK and the US." Ottawa: Science Council Research Council of Canada

de la Mothe, John R. and Laura Winer
1982 "Cybernetics and the STS Curricula." Paper presented at the Annual Meeting of the American Society for Cybernetics, Columbus, Ohio

de la Mothe, John R.
1982 "Educating the Human Potential: An Integrative Approach to the Humanities and Technology." Paper presented at Interface '82, Atlanta.
1983 "Unity and Diversity: the STS Curriculum." Paper presented at annual meeting of the American Educational Research Association, Montreal. April

Esland, Geoff
1977 "Legitimacy and Control" The Open University. Milton Keyes

Gendron, B.
1977 "Technology and the Human Condition." New York: St. Martin's

Greenstein, Fred and Nelson Polsby(eds.)
1977 "Policies and Policy Making."

Haberer, Joseph
1978 "Politics and the Community of Science." New York

Habermas, Jurgen
1970 "Towards a Rational Society." Boston: Beacon Press
1973 "Legitimation Crisis." Boston: Beacon Press
1976 "Communications and the Evolution of Society." Boston: Beacon Press

Heitowit, E. et al.
1976 "Science, Technology and Society: A Guide to the Field." Ithaca: Cornell University Press

Hooker, C.A.
1980 "The Human Context of Science and Technology." Ottawa: Social Science and Humanities Research Council

Knelman, F.H.
1971 "1984 and All That." California: Wadsworth
1978 "Anti-Nation." Oakville: Mosaic Press

Kuhn, Thomas
1962 "The Structure of Scientific Revolutions." Chicago: University of Chicago Press

Lasker, G.E. (ed.)
1981 "Applied Systems and Cybernetics." Proceedings of the Applied Systems Research and Cybernetics Conference. Mexico.

Lilienfeld, R.
1978 "The Rise of Systems Theory" New York: John Wiley

Manfred, S.
1969 "Technology and its Critics" Cambridge, Mass.

Martin, I.
1979 "Social Implications of the Information Society." Montreal: GAMMA

Miller, C.M.L., Russell Moseley and Glyn Ford
1980 "The Impact of Science, Technology and Society Courses." Sussex

Mouzelis, N.P.
1967 "Organization and Bureaucracy." Chicago

Roy, R. and E. Hawk
1976 "A Survey of Academic Technology and Society Activities." Penn State University

Schumacher, E.F.
1973 "Small is Beautiful." London: Bland and Briggs

Simon, H.
1981 "The Sciences of the Artificial." Cambridge. MIT Press

Snow, C.P.
1960 " The Two Cultures." Cambridge, Mass.: CUP

Solomon, J.J.
1978 "Science and Politics." Cambridge: MIT Press

Spigel-Rosing, I. and D. de Solla Price
1977 "Science, Technology and Society." London; SAGE

Teich, Albert
1977 "Technology and Man's Future." New York: St. Martin's.

UNESCO
1981 "World Directory of Research Projects, Studies and Courses in Science and Technology Policy." Paris

Wiener, N.
1954 "The Human Use of Human Beings." Garden City, New Jersey: Anchor Books.

Biography: BA in English Literature and Science & Human Affairs, MA in Social History of Science and Education. Currently doctoral student in Science, Technology and Society (Ph.D. Humanities - Concordia University), and Lecturer in Science Education.